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Faunistic and taxonomic notes on some Madagascan Muscidae (Diptera) and descriptions of three new species

With 23 figures

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Abstract

About 220 Muscidae collected from various locations in Madagascar and belonging to the subfamilies Azeliinae, Muscinae, Mydaeinae and Phaoniinae have been identified. Several specimens of the previously unknown female of *Graphomya rossi* Zielke, 1974 were found among the material. The female's taxonomic characters are described in detail, also taking into account the intraspecific variability of some features of the females. The identification of the specimens of *Hydrotaea bella* Couri, Pont and Penny, 2006 led to the correction of a wrongly described taxonomic feature in the original species description. The notopleura of *H. bella* are not bare, as stated by the authors, but are covered with several dark setulae. Three species proved new to science and are described as *Gymnodia malagasya* spec. nov., *Helina amboa* spec. nov. and *Helina hesitancia* spec. nov. This means that six *Gymnodia* and eleven *Helina* species are now recorded from Madagascar.

Nomenclatural acts

Gymnodia malagasya spec. nov. – urn:lsid:zoobank.org:act:883AF113-5C83-417B-8DF3-2947CDBD1C52
Helina amboa spec. nov. – urn:lsid:zoobank.org:act:7638C9C7-8A5A-48FB-BF27-5B89FC69E612
Helina hesitancia spec. nov. – urn:lsid:zoobank.org:act:678EB421-99B4-4FF0-B9E5-D7808E9464A2

Key words

Afrotropical Region, Madagascar, Muscidae, *Gymnodia, Helina,* new species

Zusammenfassung

Etwa 220 Muscidae, die an verschiedenen Orten Madagaskars gefangen wurden und zu den Unterfamilien Azeliinae, Muscinae, Mydaeinae und Phaoniinae gehören, wurden bestimmt. Unter dem Material wurden mehrere Exemplare des bisher unbekannten Weibchens von *Graphomya rossi* Zielke, 1974 gefunden. Die taxonomischen Merkmale des Weibchens werden ausführlich dokumentiert, die intraspezifische Variabilität einiger taxonomischer Merkmale der Weibchen wird dabei berücksichtigt. Die Bestimmung der Exemplare von *Hydrotaea bella* Couri, Pont und Penny, 2006 führten zu einer Korrektur der Artbeschreibung. Die Notopleuren von *H. bella* sind nicht nackt, wie von den

Autoren angegeben, sondern mit zahlreichen dunklen kleinen Haaren besetzt. Drei Arten erwiesen sich als neu für die Wissenschaft und werden als *Gymnodia malagasya* spec. nov., *Helina amboa* spec. nov. und *Helina hesitancia* spec. nov. beschrieben. Damit sind von Madagaskar nun sechs *Gymnodia*- und elf *Helina*-Arten bekannt.

Introduction

Little research has been done on the muscid fauna of the Afrotropical region. So far, only about a thousand Muscidae species have been described from this huge area with a multitude of different biotopes. In comparison, about 600 species of this family of dipterans are known from Europe, which is significantly smaller in terms of area. According to Pont & Baldock (2007), this is more due to a lack of taxonomic expertise than to insufficient collecting activity. There are still numerous unidentified muscid specimens in several institutions that were collected years ago but have not yet been identified. It can be assumed that this material from the African continent still contains a substantial number of previously unknown species. The investigations of Madagascan muscids at the Institute for Biodiversity and Ecosystem Research (IBER), Sofia, Bulgaria, since 2015, revealed, for example, not only a larger number of species of *Dichaetomyia* Malloch, 1921 but also several taxa of other Muscidae. The *Dichaetomyia* species have already been dealt with in more recent articles (Zielke 2016, 2020, 2021a–c, 2022). The identified species of the subfamilies Azeliinae, Muscinae, Mydaeinae and Phaoniinae (excluding *Dichaetomyia*) are the subject of this compilation of faunistic and taxonomic observations made on 223 identified specimens. The taxonomic criteria of four muscids did not match the characteristics of the species listed in the available identification keys or original species descriptions. They are therefore considered to be representatives of three previously unknown species and are described below as new to science.

Materials and methods

The origin of the material examined as well as the processing methods and the identification of the flies were repeatedly described in detail (e.g. Zielke 2021a, b). Therefore, some sections of "Materials and methods" have been taken verbatim from recent publications and adapted with regard to the preparation and identification of the species discussed in this article.

The unidentified muscid material was preserved in high-percent ethanol and came mainly from the remains of insect traps kept in vials at the Moravian Museum, Brno and which had somehow fallen into oblivion. Many of the flies found among the remains were destroyed or had lost most body parts crucial to identification. But some specimens, apart from lost setae, were only slightly or not at all damaged and suitable for further processing and identification.

The isolated flies were cleaned in 75 % ethanol before being transferred to a solution of 30 % ethanol for soaking. They were then mounted on a pin and marked with a locality label. In order to reduce shrinkage of the flies due to too sudden drying, the samples were dried slowly in a container at constant humidity. Added acetic acid evaporated and prevented fungal infestation.

The vials with the remains usually contained labels with information on where the specimens were found. Unfortunately, no information or only handwritten labels was found about the collectors, some of whom seemed also to be locally recruited collectors. And if written information was found, it was difficult to decipher. Therefore, in general, collectors are not named, or if feasible initials are listed.

The identification key for the Madagascan Muscidae species published by Couri, Pont & Penny (2006) was primarily used. Since this is the only comprehensive key to the Malagasy Muscidae, reference is made to "the key" or to "Couri" several times, without naming the co-authors and the year of publication each time. In addition, the keys available for different groups of Muscidae (Van Emden 1951, Pont 1978, Vockeroth 1972, Zielke 1971) as well as original descriptions of related species (Couri & Pont 2014, 2016, Pont 1969, Zielke 1974) were used for identification.

Morphological terminology follows McAlpine (1981), but postpedicel (Stuckenberg 1999) is used instead of "first flagellomere" as proposed by McAlpine. As already described previously (Zielke 2020), the width of the postpedicel seen from the lateral side is called "depth" and the greatest depth of the postpedicel is always used for comparisons and ratio calculations. The length of postpedicel is measured from the most anterior margin of pedicel till the apex of postpedicel. Information about the width of frons always refer, if not stated otherwise, to the shortest distance between the margins of the eyes. Only the postsutural intra-alar setae are called as such. The so-called intra-alar setae of the presutural part of mesonotum are referred to as posthumeral and presutural setae as has already been done by previous authors (e.g. Gregor et al. 2002, 2016; Nihei & Carvalho 2009). When the length of setae or hairs of the femur is compared to the depth of femur, the depth always refers to the point of insertion of the seta or hair. The anterior width of frons is measured directly at the upper margin of lunule. Body length is measured in millimetres (mm).

External morphological features of the specimens were studied using a Zeiss Stemi SV6 stereomicroscope and images were created by means of combination of a Zeiss

Discovery 8 stereomicroscope and an AxioCam ERc5s camera. Helicon Focus 6 and Adobe Photoshop CS2 were applied for further processing of the images.
Apart from the undetermined material from the Moravian Museum, Brno (CZ) and a few specimens of IBER, identified specimens were studied and used for comparison. Specimens including type material were loaned for examination to IBER by the Entomological Departments of the California Academy of Sciences (CAS), San Francisco, the Museum für Naturkunde, Berlin and The National History Museum (NHM), London. All specimens on loan will go back to the collections that kindly made them available. However, with the consent of the colleagues from the Moravian Museum some of the originally undetermined specimens will remain in IBER's collection. The holotypes of the three new species will be returned to the Moravian Museum.

Results

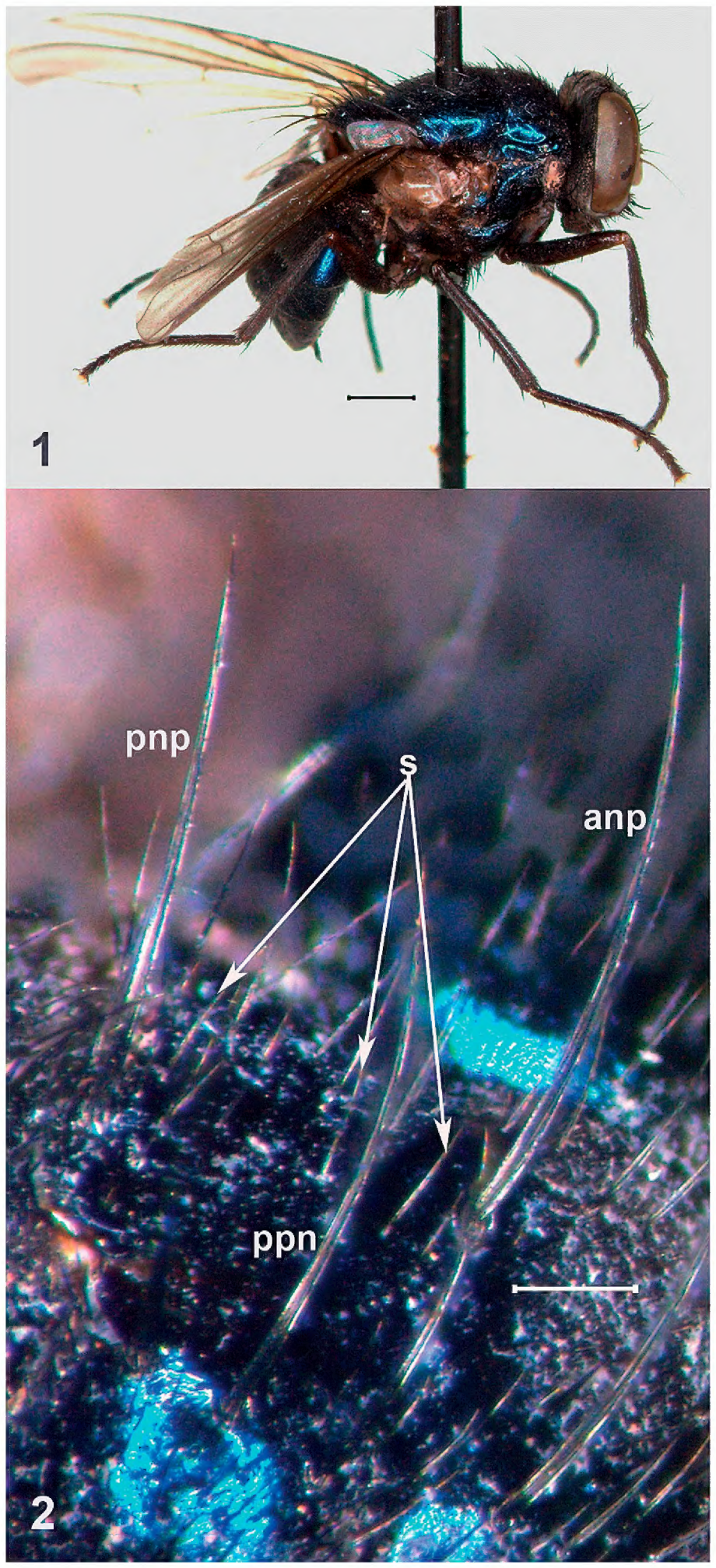
Subfamily Azeliinae

Among the material studied specimens of the genus *Hydrotaea* Robineau-Desvoidy, 1830 were the only representatives of this subfamily.

Hydrotaea bella Couri, Pont & Penny, 2006

Material examined: 1 ♀, Ambohitantely Spec. Reserve, S18°11'48,6'E47°17'05,7", 1.535 m, 17.-25.11.2011, loc. coll.; 2 ♀♀, Montagne d'Ambre N. P., 1.035 m, FIT, 13.-18.01.2016, loc. coll.; 2 ♀♀, Ambohitantely Spec. Reserve, 18°11'44,5"E47°17'14,9", 1.617 m, 26.-28.1.2016, loc. coll.; 1 ♂, Ambohitantely Spec. Reserve, 1.619 m; S18°10'17,9"E47°16'38", FIT, 06.-08.01.2017, loc. coll.; 1 ♂, 5 ♀♀, Ranomafana N. P., S21°15'46"E47°25'14", 987 m, FIT 2, 10.-14.01.2017, loc. coll.; 1 ♀, Ranomafana N. P., S21°15'44"E47°25'17", 1.020 m, FIT, 10.-14.01.2017, loc. coll.; 1 ♀, Ranomafana N. P., S21°15'47"E47°25'13", 987 m, FIT, 11.-14.01.2017, loc. coll.; 1 ♀, Ranomafana N. P., S21°15'47"E47°25'15", 989 m, FIT, 11.-14.01.2017, loc. coll.; 3 ♀♀, Andasibe-Mantadia N. P., circuit "Eulophia", S18°48'16" E48°25'43", 958 m, FIT, 22.-23.01.2017, loc. coll.; 3 ♀♀, Ambohitantely Spec. Reserve, S18°10'17,9"E47°16'38", 1.619 m, FIT, 17.-25.11.2017, loc. coll.

Remarks: *Hydrotaea bella* is the second *Hydrotaea* species known from Madagascar and was described by Couri et al. (2006). The species is strikingly metallic green or bluish in colour and its appearance is quite uncommon for African *Hydrotaea* species (Fig. 1). The species description given by the authors, however, is misleading as it says that the notopleuron has no hairs apart from the two long notopleural setae. In all specimens listed above, however, the notopleuron is clearly, sometimes even densely occupied with setulae (Fig. 2). This observation naturally raised the question of species identity. Only the examination of the female paratype from the CAS collection and the male paratype located in the NHM, London revealed that the notopleural discs of the two type specimens were also clearly covered with setulae.



Figs 1–2: *Hydrotaea bella* Couri, Pont & Penny, 2006; **1**. Female, lateral view; **2**. Notopleuron of female covered with several long setulae (anp, pnp = anterior and posterior notopleural seta, ppn = postpronotal seta, s = long setulae). (Scale bars, **Fig. 1**, 1 mm; **Fig. 2**, 0.2 mm).

Subfamily Muscinae

From this subfamily only six species have been identified, belonging to the five genera *Deltotus* Séguy, 1935, *Musca* Linnaeus, 1758, *Neomyia* Walker, 1859, *Pyrellia* Robineau-Desvoidy, 1830 and *Stomoxys* Geoffroy, 1762.

Deltotus facetus Séguy, 1935

Material examined: 1 ♀, Ambodiwangy, 23.11.1957, coll. F. Keiser; 1 ♂, 1 ♀, Ifandiana, 23.08.1958, coll. F. Keiser; 2 ♀♀, Ifandiana, 24.08.1958, coll. F. Keiser; 1 ♂, 1 ♀ Montagne d'Ambre N. P., 26.-30.10.2010, surr. camp sweeping, leg. P. B.; 1 ♀, Res. Experim. de Vohimana, Circuit 1, S18°55'33,9"E48°30'22,7", 870 m, YPT, 30.08.2012, coll. Rahanitriniaina & Rabotoson; 4 ♀♀, Montagne d'Ambre N. P., 1.035 m; FIT, 13.-18.01.2016, loc. coll.; 4 ♂♂, 47 ♀♀, Ranomafana N. P., S21°15'46"E47°25'14", 987 m, FIT 2, 10.-14.01.2017, loc. coll.; 4 ♀♀ Ranomafana N. P., S21°15'44"E47°25'17", 1.020 m, FIT, 10.-14.01.2017, loc. coll.; 3 ♀♀, Ranomafana N. P., S21°16'46"E47°25'15", 989 m, FIT, 10.-14.01.2017, loc. coll.; 4 ♀♀, Ranomafana N. P., S21°15'46"E47°25'17", 981 m, FIT 7, 10.-14.01.2017, loc. coll.; 1 ♀, Andasibe, Anamalazaotra S. R, Perinet, circuit Indri, S18.935882°-.938042°E48.419051-419332°, ca. 950 m, screen sweeping, 16.01.2017, coll. J.; 10 ♀♀ Andasibe-Mantadia N. P., circuit "Eulophia", S18°48'16"E48°25'43", 958 m, FIT, 19.-22.01.2017, loc. coll.; 8 ♀♀, Andasibe-Mantadia N. P., circuit "Eulophia", S18°48'16"E48°25'43", 958 m, FIT, 22.-23.01.2017, loc. coll.

Musca xanthomelaena Wiedemann, 1824

Material examined: 1 ♀, Ankarana N. P., ~ 120 m, sweeping border forest, 26.01.2016, loc. coll.

Neomyia albigena (Stein, 1913)

Material examined: 1 ♀, Ambohitantely Spec. Reserve; S18°11'54,9"E47°16'52,6", 1.580 m, 20.-25.11.2011, loc. coll. [This locality was also recorded in a recent contribution on African *Neomyia* species (Zielke 2021d)].

Neomyia setulosa (Zielke, 1972)

Material examined: 1 ♀, Lakana, Urwaldlichtungen, Sept. 1904, Voeltkow, (MM); 1 ♀, Ambohitantely Spec. Res., S18°11'48,6"E47°17'05,7", 1.535 m, 17.-25.11.2011, loc. coll.; 9 ♀♀, Ambohitantely Spec. Res., S18°11'44,5"E47°17'14,9", 1.617 m, 26.-28.01.2016, loc. coll.; 16 ♀♀, Ambohitantely Spec. Res., 1.585 m -1.619 m; 05.-14.01.2017, loc. coll. [These localities were also recorded in a recent contribution on African *Neomyia* species (Zielke 2021d)].

Pyrellia keiseri Zielke, 1972

Material examined: 1 ♀, Andasibe, Anamalazaotra S. R., Perinet "Aventure" metr. 0-4850, S18.935882°-792°E48.419051°, 930-1.000 m, screen sweeping, 20.01.2017, coll. J.

Stomoxys niger Macquart, 1851

Material examined: 1 ♂, Ankarafansika N. P., 100 m, 22.-24.06.2011, loc. coll.

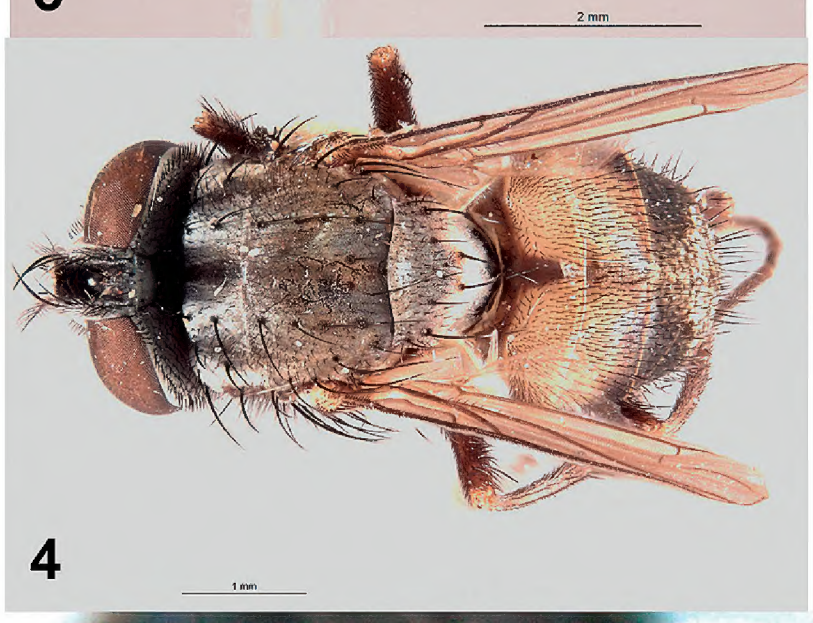
Subfamily Mydaeinae

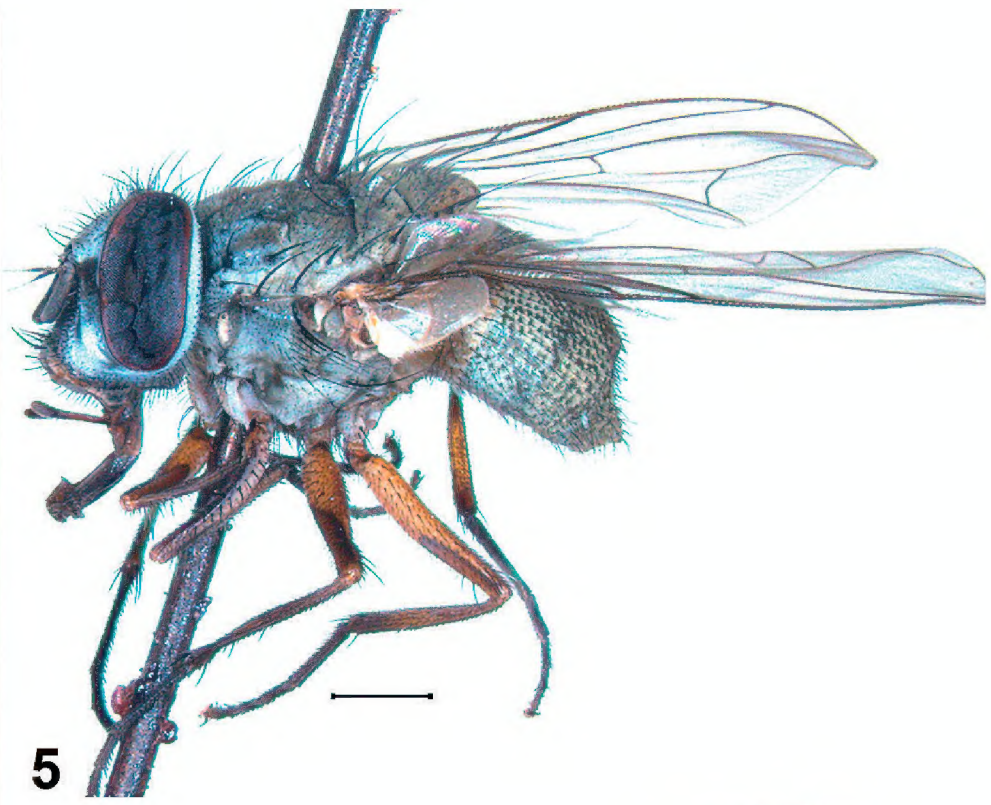
Six species have been identified from this subfamily, belonging to *Graphomya* Robineau-Desvoidy, 1830, *Gymnodia* Robineau-Desvoidy, 1830 and *Myospila* Rondani, 1856. One *Gymnodia* species is new to science.

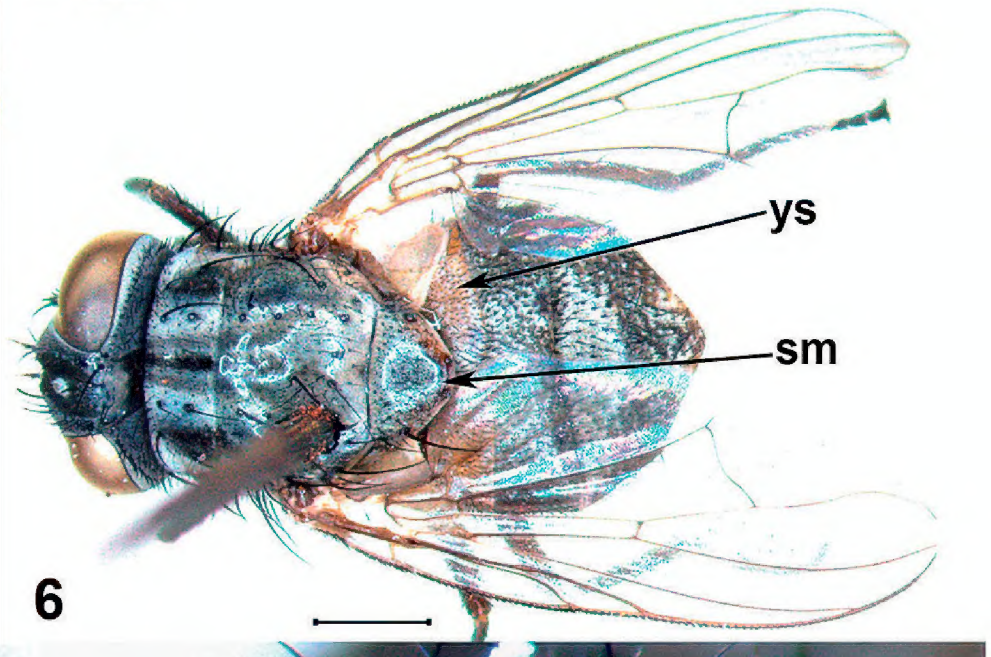
Graphomya rossi Zielke, 1974

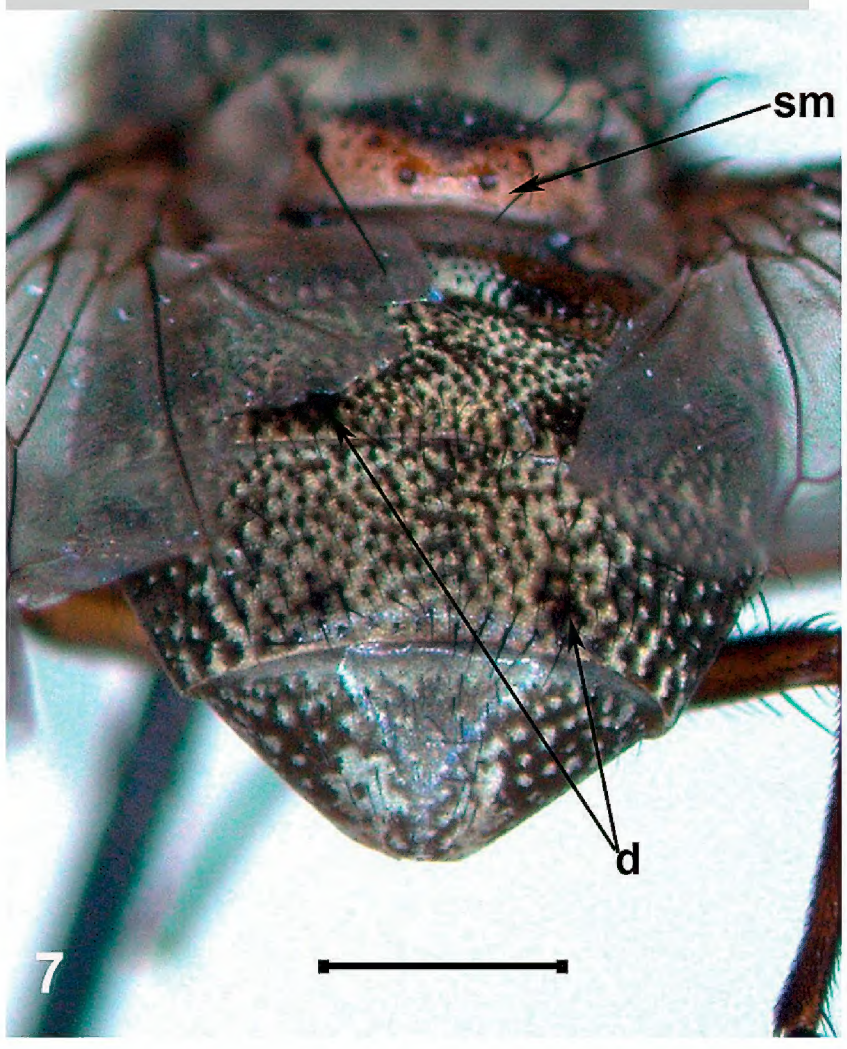
Material examined: 3 ♀♀, Ambohitantely Spec. Reserve, S18°11'51,9"E47°16'59", 1.585 m, FIT, 05.-08.01.2017, loc. coll.; 24 ♀♀, Ambohitantely Spec. Reserve, S18°10'17,9"E47°16'38", 1.619 m, FIT, 06.-08.01.2017, loc. coll.

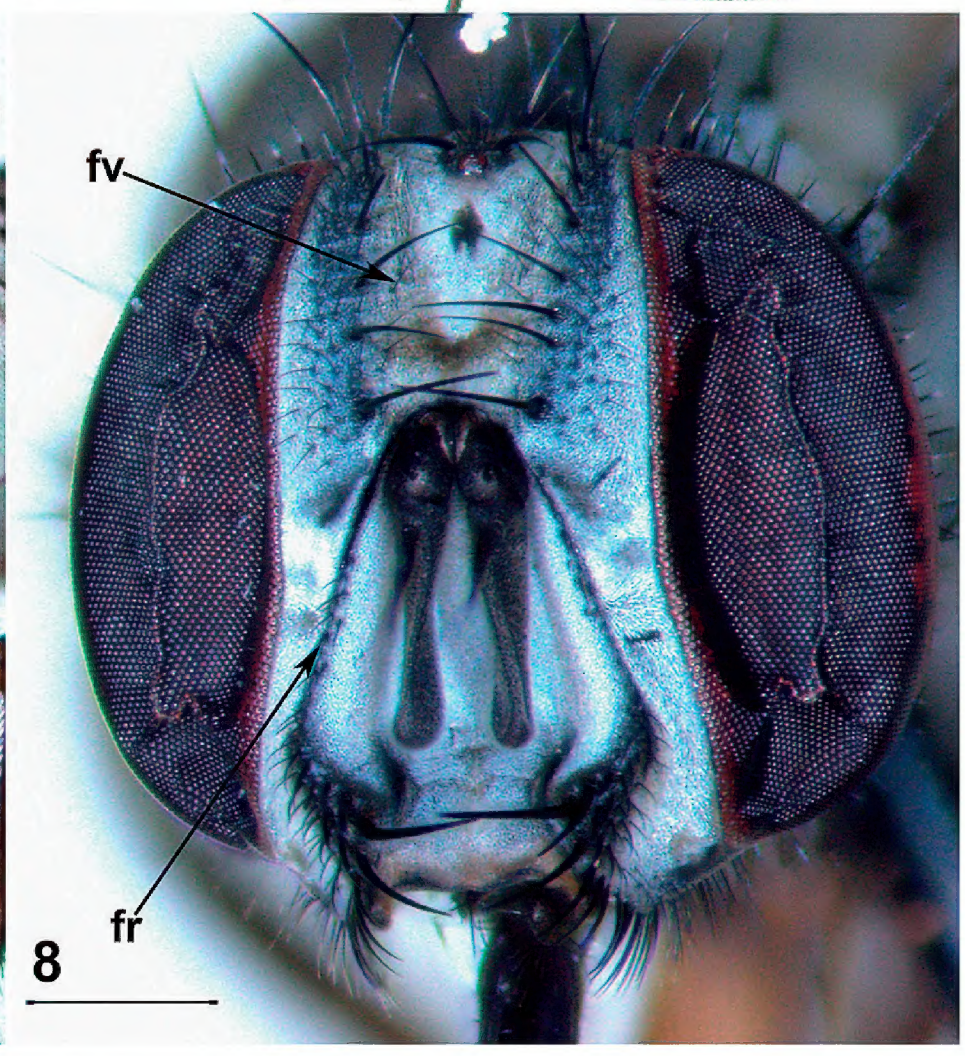
Remarks: The species was described in 1974 from a single male from the area around Tananarive in Central Madagascar. The male was notable for having a fairly large head in relation to its body size (Fig. 3). Couri et al. (2006) also mentioned the size of head when studying the holotype of *G. rossi*. Apart from the holotype no other male or female of this species or any other *Graphomya* species has so far been reported from Madagascar.
However, among the the undetermined Malagasy Muscidae, several *Graphomya* females were identified. They had been collected in the Ambohitantely Reserve, also located in Central Madagascar. The females resemble the male of *G. rossi* in body size and in the strikingly large heads (Fig. 5). Comparison with various images kindly taken of the male holotype and made available by CAS revealed no significant differences in body structure and chaetotaxy. However, pattern and colouring of the thorax differ slightly, but more clearly in the abdomen (Figs 4 & 6). Moreover, the females also showed a broad range of individual variability of taxonomic characters. Since males and females of some other species of the genus also differ in colour and pattern of the body and since no











Figs 3–8: *Graphomya rossi* Zielke,1974; ♂ holotype; **3**. Lateral view; **4**. Dorsal view. Females; **5**. Lateral view; **6**. Dorsal view (sm = dorsal margin and lateral sides of scutellum predominantly greyish; ys = syntergite 1 + 2 predominantly yellowish); 7. Postero-dorsal view of scutellum and general ground pattern of abdomen (sm = dorsal margin and lateral sides of scutellum strikingly reddish yellow; d = dark patches on tergites 3 and 4); **8**. Anterior view of head (fr = facial ridge with row of black setulae; fv = frontal vitta with a row of setulae inside of the row of fronto-orbital setae). (Scale bars, **Fig. 3**, 2 mm; **Figs 4–7**, 1 mm; **Fig. 8**, 0.5 mm). The photographs of the male holotype of *G. rossi* (Figs 3 & 4) were taken by Rachel Diaz-Bastin of the California Academy of Sciences, San Francisco, USA and kindly provided for processing and comparison.

other *Graphomya* species is known from Madagascar, it is assumed for the time being that the females belong to *G. rossi*. In the following, the taxonomic features of the females and their individual variability are compiled and compared with the taxonomic features of the holotype, the only available male of the species.

Taxonomic characters (female): Head (Figs 3, 5 & 8). Similar to the male (Fig. 3), the female has a relatively large head in relation to the body size (Fig. 5). Ground-colour predominantly dusted greyish-white (Fig. 8). Dichoptic; in contrast to the male eyes very sparsely haired, however, areas on the upper margin of the eye and near the frons show some more and longer hairs; facets not distinctly enlarged. Frons slightly dilating towards the anterior margin; at level of vertex about one third as wide as maximal head width; at level of anterior ocellus about 3.2 times and at anterior margin of frons 3.8 times as wide as the distance between the outer margins of posterior ocelli. Fronto-orbital plate at level of anterior ocellus about twice as wide as diameter of anterior ocellus; anterior tip of frontal triangle reaching anterior margin of frons. In profile upper mouth margin protruding clearly beyond profrons (Fig. 5). Parafacial at level of antenna basis almost twice as wide as depth of postpedicel, narrowing along its length and at the lower part about as wide as depth of postpedicel. Genal depth below lowest eye margin barely half as wide as depth of postpedicel. In anterior view frontal vitta of dark ground colour and clearly, but not as densely dusted grey-white as fronto-orbital plates and frontal triangle, the latter in the middle with a brown, somewhat oblong and oval shaped spot (Fig. 8), ocellar triangle dusted grey. Parafacial densely whitish, at level of the base of postpedicel a conspicuous dark patch, changing its shape and colour-density depending on viewing angle (Figs 5 & 8), gena and peristomal area greyish-white, with small faintly shaped patches brownish to dark coloured and changing shape and colour depending on incidence of light; face greyish-white dusted; facial ridge predominantly white, separated from parafacial by a row of black setulae strongly contrasting to the greyish white surroundings (Fig. 8). Antennal segments brown or dark brown, at certain point of viewing more or less densely greyish dusted. Postpedicel about 3.2 times as long as deep and about three times as long as pedicel. Arista brown and approximately 1.3 times as long as length of postpedicel, basal third clearly thickened, longest hairs of arista about 1.5 times as long as depth of postpedicel. Fronto-orbital plate (Fig. 8) throughout its length with five or six inclinate setae, the anterior seta longer than the following setae of about the same length, a few smaller interstitial hairs between the fronto-orbital setae in anterior third of fronto-orbital plate; at level of anterior tip of ocellar triangle two strong slightly reclinate orbital setae, the anterior seta somewhat shorter than the posterior; inner and outer vertical and the ocellar setae about of same length and about as long as the longest fronto-orbital seta. Fronto-orbital plate densely covered with relatively long setulae, usually also a row of setulae on the frontal vitta along the inner side of the row of fronto-orbital setae. Parafacial bare, facial ridge along its entire length with a row of strong dark setulae (Fig. 8), the lower ones clearly longer. Vibrissal setae strong, only somewhat longer than the longest surrounding peristomal setae. Anterior part of gena bare, lateral surface and post-occipital surface dusted pale greyish and with dark seta-like hairs. Proboscis slender not dilating, prementum shiny dark brown, length of labella about 1.5 times as long as depth of proboscis; palpus strikingly slender and in basal two thirds yellowish-brown, distal part dark brown and somewhat clavate, slightly longer than prementum.

Thorax (Figs 5–7). Ground-colour predominantly greyish. Mesonotum greyish, in dorsal view similar to the male a narrow median longitudinal black stripe bordered on each side by a paramedian dark grey stripe (Fig. 5), the width of the black stripe varying greatly from very narrow to almost as wide as the dark grey stripes which are also of different widths in the individual females; each row of presutural dorsocentral setae surrounded by a broad whitish-grey stripe; the area between the presutural dorsocentral setae and the posthumeral and presutural seta with an elongated, irregularly demarcated dark grey patch-like stripe, varying greatly in extent in the individual females. As in the male, the stripes in the females are mostly confined to the presutural part of the mesonotum when viewed directly dorsally, but small changes of perspective in some females can result in the stripes being more or less visible even in the postsutural part of the mesonotum, the latter being predominantly uniform grey in all females. In some specimens the dorsal and lateral surfaces of the scutellum uniformly greyish and of the same colour as the mesonotum, in others, similar as in the male, the scutellum is marked by a more or less well-defined broad pale or yellowish-ochre margin and lateral surfaces (Fig. 7). Postpronotum in some specimens at certain viewing angles dusted greyish white, however, in general greyish like notopleuron and supra-alar area and all lateral pleura; anterior and posterior spiracles greyish-white. Acrostichals 0+1 well developed, about as long as the setae of the three pairs of anterior postsutural dorsocentral setae; dorsocentrals 2+4, all well-developed; the most posterior dorsocentral seta clearly longer than the others; postpronotal setae 1-2, the outer seta at least four times as long as the inner seta, the latter one sometimes not distinguishable from ground-hair; posthumeral seta 1, somewhat shorter than the presutural seta; two notopleural setae, about of equal length, notopleuron with several black setulae; pre-alar seta 1; intra-alar seta 1, different from male with two intra-alar setae, supra-alar seta 1, post-alar setae 3. Greater ampulla and suprasquamal ridge bare. Prosternum, anepimeron, proepimeral area bare, katepimeron usually at least with 1-3 setulae and meron

below posterior spiracle with some dark setulae, but bare above hind coxa. Katepisternals 0+2, the lower one distinctly shorter, however, two females with a distinct anterior katepisternal seta on each side, somewhat shorter than the posterior lower seta, but clearly longer than surrounding hairs. Anepisternals 1+7-9, the posterior setae of different length but clearly longer than the seta-like interstitial hairs. Scutellum with a pair of strong apical and strong lateral setae, basal and preapical setae clearly shorter but much longer than the numerous seta-like ground-hair, lateral surface including the margin to ventral surface with some dark setulae.

Wing (Fig. 6). Membrane hyaline without coloured tinge, cross-veins and surrounding membrane not infuscate. Tegula greyish-brown, basicosta yellow, veins dark. Costal spine barely distinguishable from adjacent bristles. Radial node and vein R4+5 dorsally and ventrally with several setulae, barely reaching midway to cross-vein r-m. Vein M diverging from vein R4+5, but curved apically strongly toward R4+5 and then continued somewhat sinuously before reaching wing margin. Cross-vein r-m basad of the point where vein R1 enters costa; distal cross-vein dm-cu somewhat sinuous and slightly oblique. Calypters whitish transparent, margin white with a weak yellowish tinge, lower calypter conspicuously enlarged, similar to lower calypter of *Musca* species, whitish transparent with a white margin (Fig. 5). Haltere with yellowish-white stem and yellow knob.

Legs (Fig. 5). In contrast to the predominantly uniformly brown legs of the male (Fig. 3), with the coxae grey, trochanters yellowish to brown, femora predominantly yellow, in the apical half with brown longitudinal patches of different size, tibiae dark yellowish or brown depending on incidence of light, and tarsi dark brown. Pulvilli and claws well developed but barely half as long as the associated tarsomeres. Fore femur with complete rows of posterodorsal, posterior and posteroventral setae, posteroventrals about as long as depth of femur, posterodorsals and posteriors barely as long as depth of femur. Fore tibia without a median posterior seta. Mid femur in basal half with a row of about four strong anterior setae, about half as long as depth of femur, one or two seta-like ventral hairs not as long as the anterior setae; in distal half, a row each of short anteroventral and posteroventral hairs, preapically two strong posterior to posterodorsal bristles, no anterodorsal seta. Mid tibia in distal half with a posterior or posteroventral seta, slightly longer than the diameter of the tibia, and usually in the apical third an almost posterodorsal seta, barely as long as the diameter. Hind coxa bare on posterior surface. Hind femur with complete row of anterodorsal setae not as long as depth of femur, apically about two well developed anteroventral setae, preapically one strong posterodorsal or almost dorsal seta. Hind tibia without a long posterodorsal seta, at middle third one anterodorsal and one anteroventral seta, both setae about as long as diameter of tibia.

Abdomen (Figs 3–7). Pattern different from male abdomen which is characterized by primarily yellow anterior tergites and predominantly dark tergites 4 and 5 (Fig. 3 & 4). In the female abdomen, only syntergite 1+2 is partially or largely yellow (Fig. 6), under certain light conditions dorsally with a median longitudinal stripe, dusted mostly greyish, in a few females somewhat brownish. Surfaces of tergites 3 to 5 of greyish white ground colour, densely covered with short, semi-erect dark hairs. Each hair basis is surrounded by a dark brown dot. Depending on conditions of light some of the brown dots change form and size, either disappear almost completely or fuse with adjacent spots causing irregularly greyish-white areas of varying size depending on the viewing angle. Depending on certain light incidence on the dorsal surfaces of tergites 3 and 4 a pair of dark brown round patches, which vary greatly in size from small to medium-large, but usually do not reach the margins of the corresponding tergite (Fig. 7). Ventral parts of tergites 3 to 5 greyish, the margins adjacent to sternites yellow. The dorsal marginal setae of each of the three posterior tergites rather short, only on tergite 5 a few longer lateral discals present, but also not noticeably long. Sternites yellow; margin of sternite 1 densely set with setulae, in addition some longer setae on the middle part of the margin.

Female genitalia. Not examined.

Measurements: Length of body about 6.0 mm; length of wing about 5.5 mm.

Male: Holotype originally described in a previous contribution (Zielke 1974).

Gymnodia differa (Couri, Pont & Penny, 2006)

Material examined: 1 ♀, Ambohitantely Spec. Reserve, S18°10'17,9"E47°16'38", 1.619 m, FIT, 06.-08.01.2017, coll. P. B.; 2 ♀♀, Ranomafana N. P., S21°15'46"E47°25'14", 987 m, FIT 2, 10.-14.01.2017, coll. P. B.; 2 ♀♀, Andasibe, Anamalazaotra S. R, Perinet, circuit Indri, S18.935882°-.938042°E48.419051-419332°, ca. 950 m; screen sweeping, 16.01.2017, coll. J.; 1 ♀, Maromizana prot. area, S18.96547°-962674°E48.45478°-453146°, 1.100 m, screen sweeping, 21.01.2017, coll. J.

Gymnodia malagasya spec. nov.

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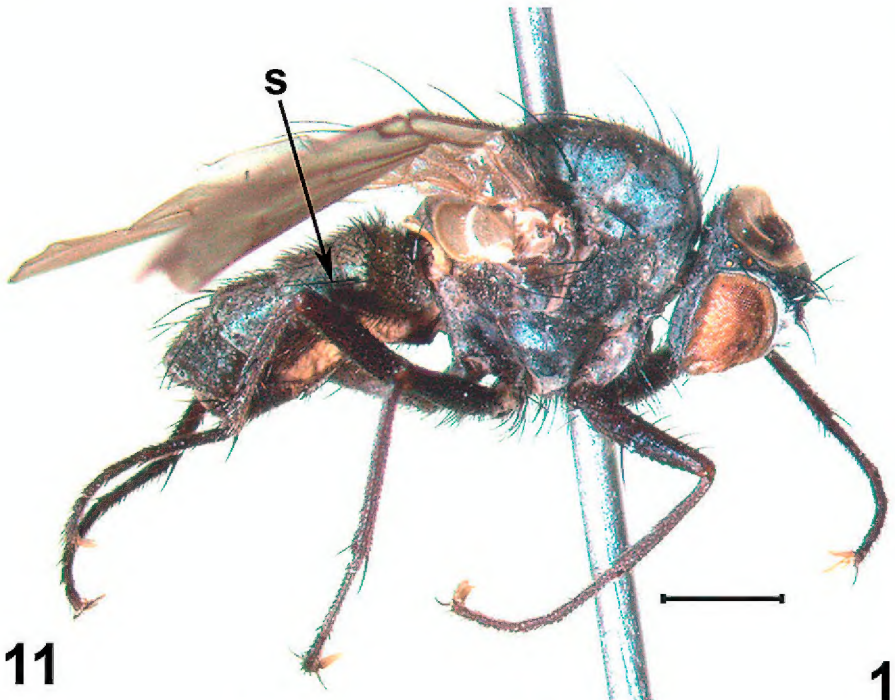
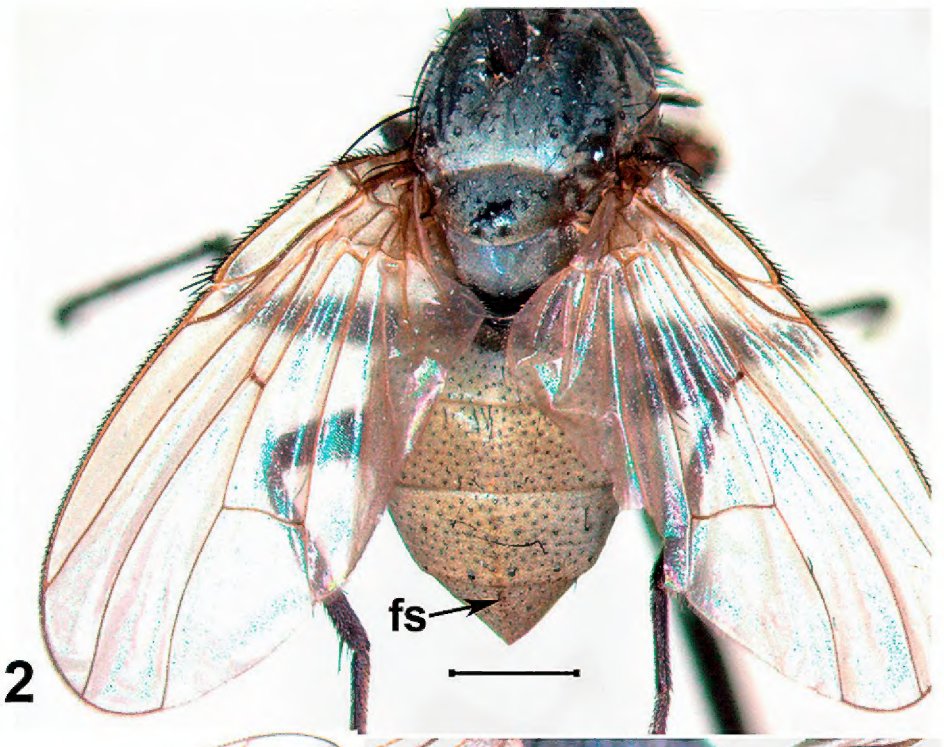
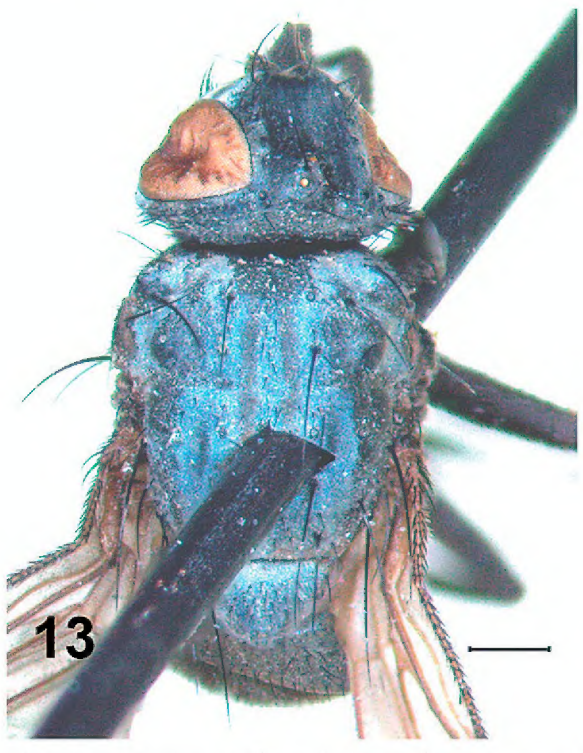
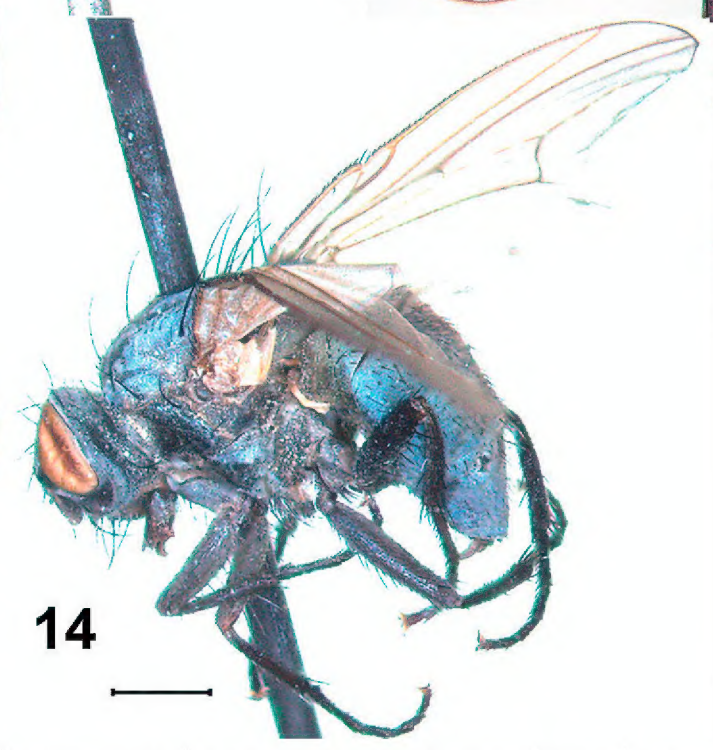
Material examined: ♀ holotype, E. Madagascar, Ranomafana N. P. S 21°15'46"E47°25'14", 987 m, FIT 2, 10.-14.01.2017 loc. coll.

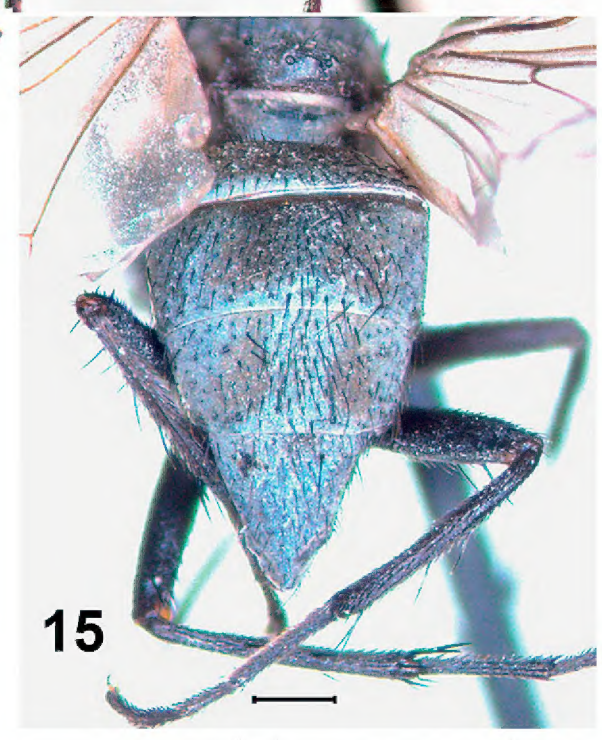
The specimen is lacking the left fore leg, abdomen is somewhat shrunk.







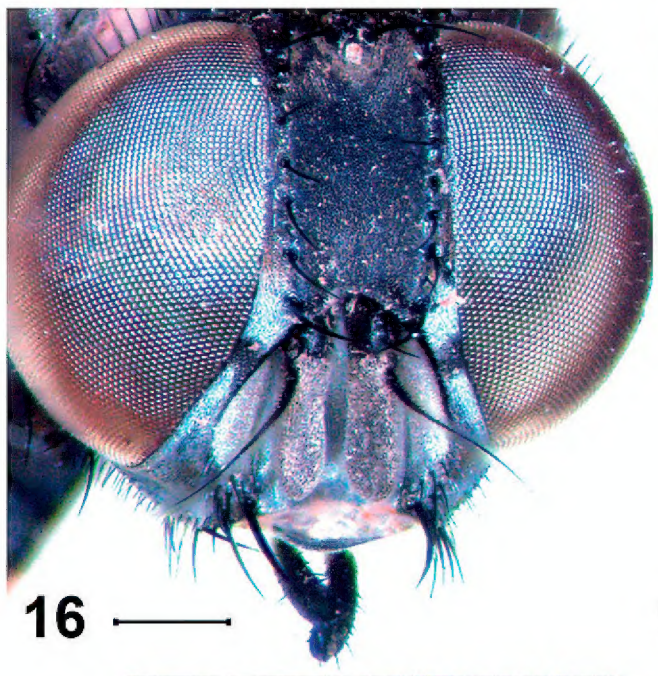


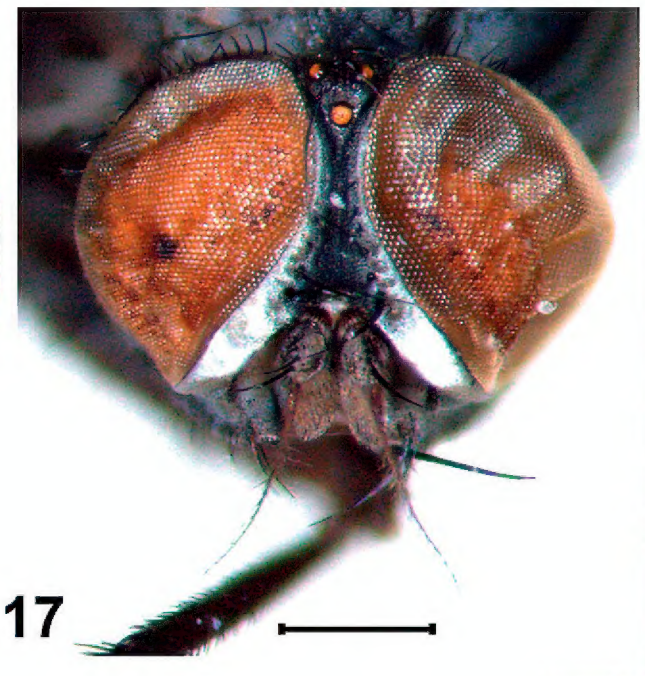


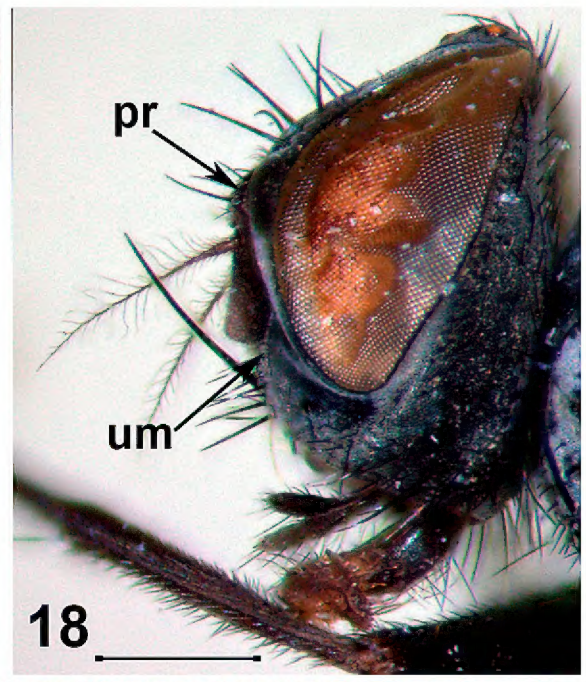
Figs 9–15: Lateral and dorsal views of the types of the new species; *Gymnodia malagasya* spec. nov.; ♀ holotype, **9.** Lateral view. *Helina amboa* spec. nov., ♂ holotype, **10.** Dorsal view, **11.** Lateral view (s = conspicuously long seta laterally of syntergite 1+2). ♀ paratype, **12.** Dorsal view. *Helina hesitancia* spec. nov., ♀ holotype, **13.** Dorsal view of thorax, **14.** Lateral view, **15.** Dorsal view of abdomen. (Scale bars, **Figs 9–12** and **14**, 1 mm; **Figs 13 & 15**, 0.5 mm).

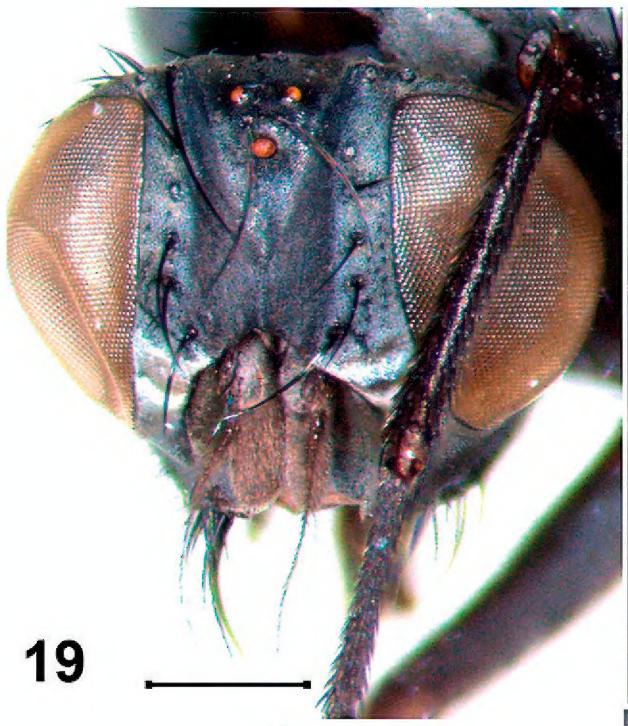
Etymology: The species name *malagasya* is a feminine adjective referring to Madagascar, the country where the species was collected.

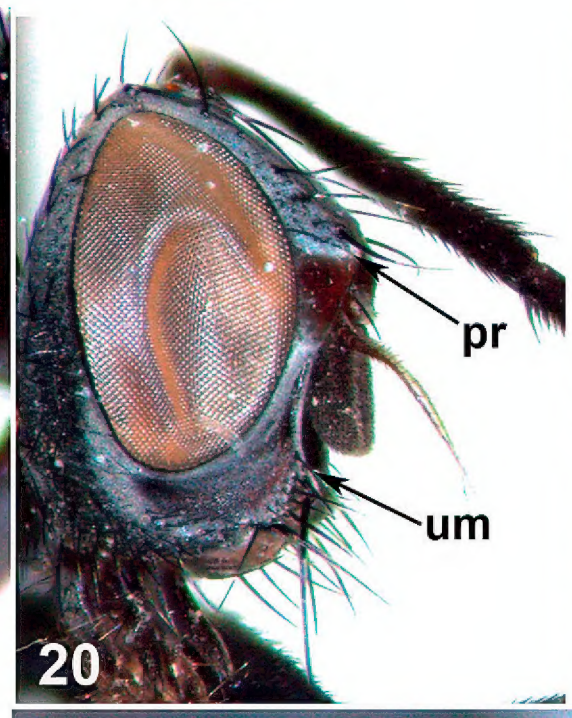
Description (female): Head (Fig. 16). Ground-colour dark brown, partially dusted greyish-white with a distinct light brownish tinge. Dichoptic; eyes with some sparsely distributed but clearly noticeable small hairs and without clearly enlarged facets. Frons almost parallel-sided, very slightly dilated towards the anterior margin; at level of vertex about a quarter as wide as maximal head width; at level of anterior ocellus about 3.3 times and at anterior margin of frons 3.7 times as wide as the distance between the outer margins of posterior ocelli. Shortest

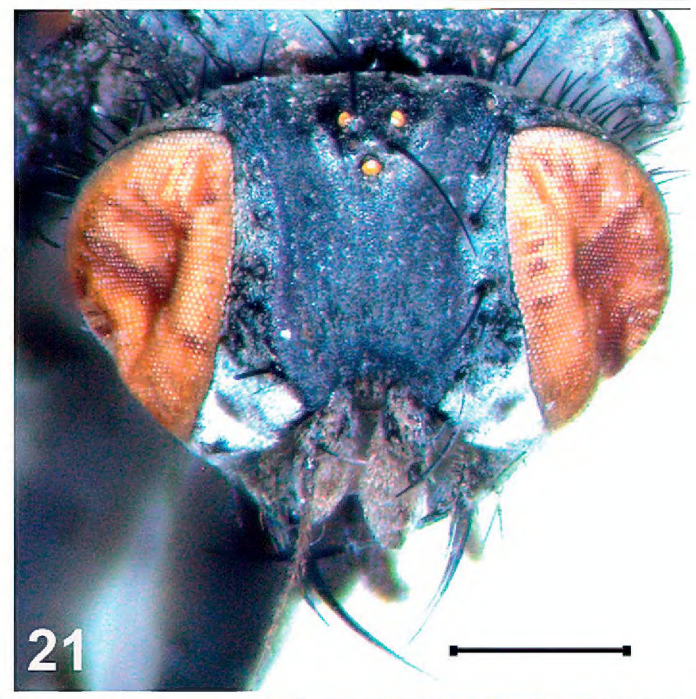


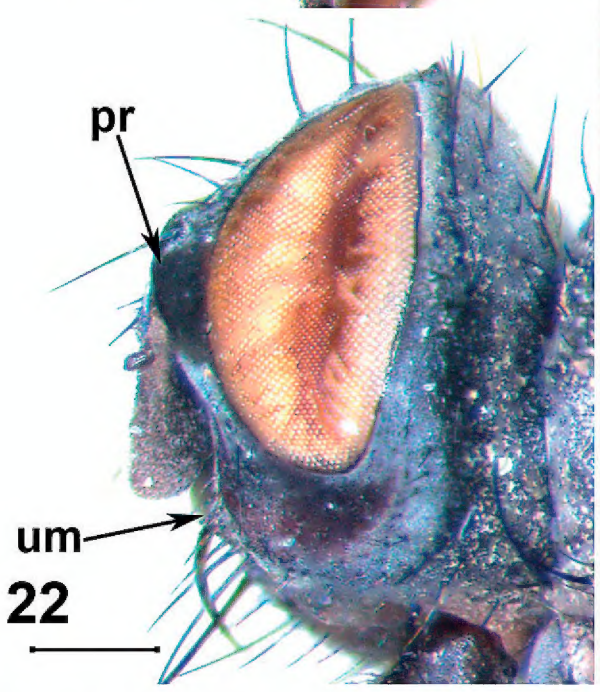


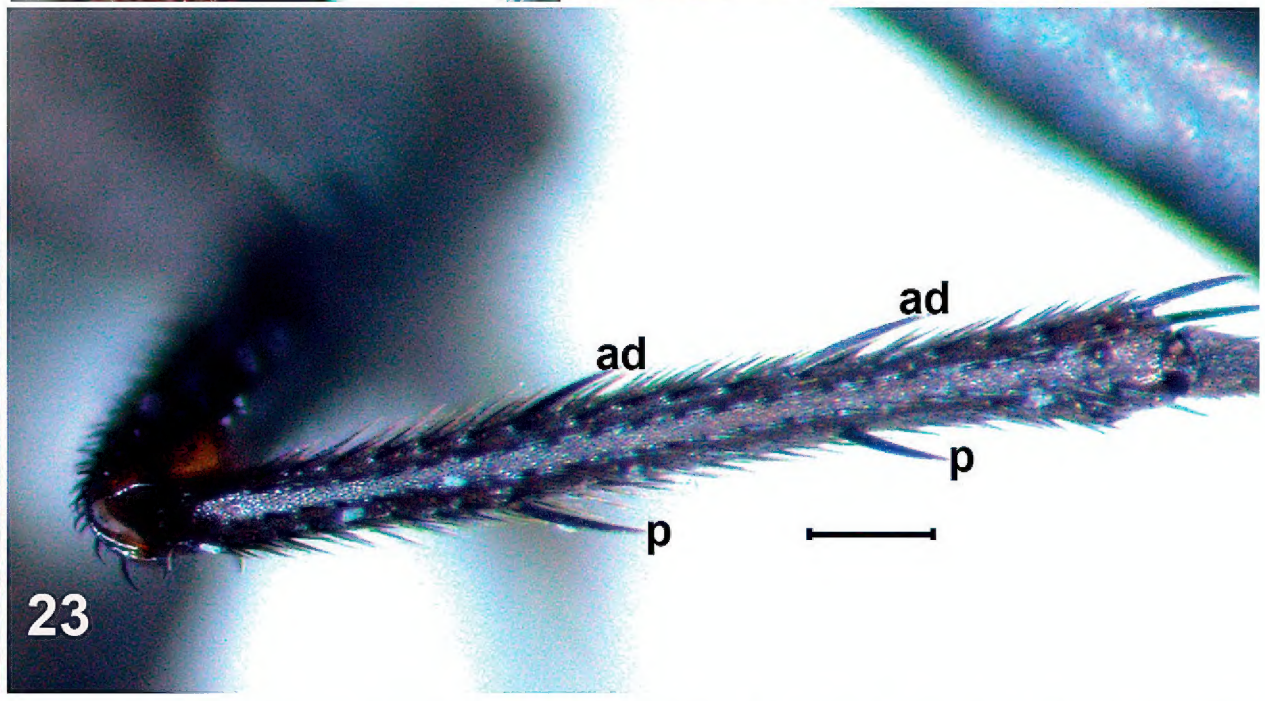












Figs 16–23: Anterior or lateral view of heads of types of the new species and dorsal view of a mid tibia. *Gymnodia malagasya* spec. nov.; ♀ holotype, **16**. Antero-dorsal view. *Helina amboa* spec. nov., ♂ holotype, **17**. Antero-dorsal view; **18**. Lateral view. ♀ paratype; **19**. Antero-dorsal view, **20**. Lateral view. *Helina hesitancia* spec. nov.; ♀ holotype, **21**. Antero-dorsal view, **22**. Lateral view, **23**. Dorsal view of right mid tibia. (ad = anterodorsal seta, p = posterior seta, pr = profrons, um = upper mouth margin. Scale bars, **Figs 16–22**, 0.5 mm; **Fig. 23**, 0.2 mm.)

distance between eyes about 3.3 times the width between the outer margins of posterior ocelli, fronto-orbital plate at narrowest part about as broad as diameter of anterior ocellus; frontal triangle very short, anterior tip slightly below level of lower reclinate ocellar seta. In profile upper mouth margin in line with profrons. Parafacial at level of antennal base almost as wide as depth of postpedicel, tapering somewhat downwards and then about parallel-sided along its entire length, about half as wide as postpedicel. Genal depth below lowest eye margin about as wide as depth of postpedicel. In anterior view frontal vitta matt dark brown to blackish, ocellar triangle depending on light conditions shiny blackish or sparsely dusted greyish; upper half of fronto-orbital plate dark brown, slightly shiny at certain viewing angle, lower half dusted more or less greyish-white with a brownish tinge depending on incidence of light, anterior part of the fronto-orbital plate and parafacial more densely dusted

greyish-white, the latter with a conspicuous dark spot at the level of the base of postpedicel; gena and peristomal area more or less dusted depending on angle of viewing, face and facial ridge uniformly dusted like parafacial. Antenna predominantly dark brown to black, at certain viewing angles postpedicel densely dusted greyish-brown, pedicel black. Postpedicel at least three times as long as deep and almost three times as long as pedicel. Arista brown, about two and a half times as long as length of postpedicel, basal fifth somewhat dilated, longest hairs of arista barely as long as diameter of dilated base of arista. Fronto-orbital plate throughout its length with five or six almost equally long inclinate setae, the most anterior seta slightly stronger and somewhat longer, about two small interstitial hairs between the fronto-orbital setae in anterior third of fronto-orbital plate; at level of anterior tip of ocellar triangle two reclinate orbital setae somewhat shorter than the fronto-orbitals, the anterior orbital seta shorter than the posterior seta; inner and outer vertical and ocellar setae about of equal length and distinctly longer than the longest fronto-orbital setae. Parafacial and fascial ridge bare apart from the group of setulae in the peristomal corner. Vibrissal setae very strong but only slightly longer than the longest surrounding peristomal setae. Anterior part of gena bare, lateral surface and postoccipital surface greyish dusted and with dark seta-like hairs. Proboscis not conspicuously long, prementum depending on viewing angle shiny brown or somewhat dusted greyish, length of labella slightly longer than anterior depth of proboscis; palpus brown, somewhat longer than prementum and weakly clavate, with some long setae.

Thorax (Fig. 9). Ground colour brown to dark brown, some parts of the thorax, especially the lateral ones, dusted greyish in certain light conditions. Mesonotum without any specific pattern, uniformly dark brownish, depending on viewing angle somewhat shiny or dusted matt brownish. Dorsal surface of scutellum concolourous with mesonotum, at certain viewing angle lateral surfaces partly shiny dark grey. Depending on incidence of light postpronotum brownish or more or less dusted greyish, somewhat contrasting to the dark surrounding areas. Pleura, depending on viewing angle, light brownish or with dense light greyish dusting. Anterior spiracle light greyish-brown. Dorsocentrals 2+4, all well-developed; acrostichals 0+1, seta about half as long as posterior dorsocentral seta, presutural acrostichal hairs in four irregular rows, hairs of outer rows not distinctly longer than those of inner rows; postpronotal setae 3, the outer seta at least twice as long as the most inner seta; posthumeral seta 1, about as long as the presutural seta; notopleural setae 2, almost of same length, notopleuron without any setulae or hairs; pre-alar seta not distinguishable from surrounding ground-hair; intra-alar setae 2, the anterior well developed but clearly shorter than the posterior seta, supra-alar setae 2, the posterior weak and distinctly shorter, post-alar setae 3. Greater ampulla and suprasquamal ridge bare. Prosternum, anepimeron, proepimeral area, katepimeron and meron without hairs. Katepisternals 1+3, the lower two about equally long, distinctly closer to the posterior than to the anterior seta and clearly shorter than the anterior and posterior upper setae. Anepisternals 1+6-7, the posterior setae of different length but clearly longer than the seta-like interstitial hairs. Scutellum with a pair of strong apical and strong lateral setae, basal and preapical setae distinctly shorter but clearly longer than the seta-like ground-hair, lateral surface including the margin to ventral surface bare.

Wing (Fig. 9). Membrane with a brownish tinge, cross-veins and surrounding membrane not infuscate. Tegula and basicosta dark brown, veins brown. Costal spine barely distinguishable from adjacent bristles. Radial node and vein R4+5 dorsally and ventrally bare. Vein M diverging from vein R4+5, but before reaching wing margin strongly curved forward to R4+5 with the most apical part being somewhat sinuous. Cross-vein r-m about at the level of the point where vein R1 enters costa; distal cross-vein dm-cu somewhat sinuous and slightly oblique. Upper calypter predominantly hyaline with a conspicuously dark, almost blackish margin, lower calypter matt brownish, margin broad and dark brown (Fig. 9). Stem and knob of haltere yellow.

Legs (Fig. 9). Coxae, trochanters, femora, tibiae and tarsi brown to dark brown (Fig. 9). Pulvilli and claws well developed but small, barely half as long as the associated tarsomere. Fore femur with complete rows of posterodorsal, posterior and posteroventral setae, posteroventrals somewhat longer than depth of femur, posterodorsals and posteriors about as long as depth of femur. Fore tibia without a median posterior seta. Mid femur in basal half with a row of anterior setae, about half as long as depth of femur and about four distinct almost spine-like posteroventral setae slightly longer than the anterior setae; in distal half a row each of anteroventral and posteroventral seta-like hairs, shorter and weaker than the basal setae, preapically two strong posterior to posterodorsal bristles. Mid tibia in middle third with one strong posterior seta somewhat longer than the diameter of tibia. Hind coxa bare on posterior surface. Hind femur with complete row of strong anterodorsal setae about as long as depth of femur, a row of anteroventral setae, the two most apical setae of which longer than depth of femur and the anterodorsal setae, the other setae of the row about one third as long as depth of femur, in basal half about three posteroventral setae, about half as long as depth of femur, preapically one strong posterodorsal or almost dorsal seta. Hind tibia without long posterodorsal seta, at middle third one anterodorsal and one anteroventral seta, both setae somewhat longer than diameter of tibia.

Abdomen. Syntergite 1+2 with anterior part dark brown, the anterior half of posterior part yellow, bordered by a broad brown posterior margin. Basic colour of tergites 3 to 5 grey; each seta, including the small hairs of the ground hair, with a distinct brown dot at its base on the

surface of the tergite. The tergites are densely covered with ground hair, and depending on conditions of light several brown dots of the hairs are fused into brown irregularly shaped large patches, resulting in an irregular pattern of brown and grey patches, the latter also marked by brown dots of individual setae. Therefore, the general appearance of abdomen is brownish. Each of the three posterior tergites with a row of marginal setae that are not very long but clearly recognizable, tergite 5 also with a row of discal setae. Lateral and ventral parts of tergites concolorous with dorsal surface of tergites apart from syntergite 1+2 that is ventrally predominantly yellow. Sternites brown without dark dots at the base of the setae; sternite 1 with a few black seta-like hairs at the margin.
Female genitalia. Not examined.

Measurements: Length of body about 6.2 mm; length of wing about 5.8 mm.

Male: Not known.

Diagnosis: Using Van Emden's key (1951) to the genus *Gymnodia* the characteristics of the new species lead to *Gymnodia fusciventris* Van Emden, 1951. However, the new species is characterized by the partly yellow coloured syntergite 1+2 and the greyish coloured dorsal surface of tergites 3-5 with a dark dot at the base of each seta and setula causing on the abdomen large dark brown areas consisting of fused dots, calypters with conspicuous dark brown margins, upper calypter hyaline, lower with a clear brownish tinge, whereas *G. fusciventris* has a uniformly dark abdomen without yellow markings and fusing dark brown dots and the calypters are creamy yellow with concolourous margins. In Couri's et al. identification key to the Madagascan *Gymnodia* species, *Gymnodia malagasya* runs to *Gymnodia differa* Couri, Pont & Penny, 2006, it differs from the latter by completely dark legs, predominantly dark brown dorsal surface of thorax, lower calypter with dark brown margin, and syntergite 1+2 predominantly dark, only the lateral parts and a transverse band connecting the lateral surfaces are yellow. *G. differa* however has strikingly yellow legs, the lateral parts of dorsal thorax surface are dusted greyish partly with a distinct yellowish tinge, syntergite 1+2 is completely yellow and the margin of lower calypter is whitish-yellow.

Myospila bekilyana (Séguy, 1938)

Material examined: 3 ♀♀, Montagne d'Ambre N. P., 1.040 m; 12°312'37"E49°10'15"; YPT, 13.-18.01.2016, loc. coll.; 2 ♀♀, Andasibe, Anamalazaotra S. R., Perinet "Aventure" metr. 0-4850, S18.935882°-792°E48.419051°, 930-1.000 m, screen sweeping, 20.01.2017, coll. J.

Myospila lenticeps (Thomson, 1869)

Material examined: 1 ♀, Ambohitantely Spec. Reserve, S18°11'54,9"E47°16'52,6", 1.580 m, 20.-25.11.2011, loc. coll.; 1 ♀, Beforona commune, Ambavaniasy village, S18°56'47,1 E"48°30'58, 788 m; 09.06.2012, loc. coll.; 2 ♀♀, Res. Experim. de Vohimana, Circuit 1, S18°55'33,9"E48°30'22,7", 870 m, YPT, 30.08.2012, coll. Rahanitriniaina & Rabotoson; 1 ♂, 11 ♀♀, Zombitse N. P., S22°54'11,4"E44°41'31,8", 816 m, 26.01.2013, loc. coll.; 11 ♀♀, Andranomena Sp. Res., 20°08'52,2"E44°30'52", 27 m, 02.02.2013, loc. coll.; 1 ♀, Montagne d'Ambre N. P., 12°312'37"E49°10'15", 1,040 m, YPT, 13.-18.01.2016, loc. coll.; 4 ♀♀, Ambohitantely Spec. Reserve, S18°11'51,7"E47°17'06", 1,604 m., 26.-28.1.2016, loc. coll.; 1 ♀, Andasibe, Anamalazaotra S. R., Perinet "Aventure" metr. 0-4850, S18.935882°-792°E48.419051°, 930-1.000 m, screen sweeping, 20.01.2017, coll. J.

Myospila paradoxalis (Stein in Becker, 1903)

Material examined: 1 ♀, Ankarafansika N. P., 100 m, 22.-24.06.2011, loc. coll.

Subfamily Phaoniinae

In addition to several *Dichaetomyia* species dealt with in earlier publications and four recently described *Helina* species (Zielke 2021e), two specimens of *Aluaudinella* Giglio-Tos, 1895 and three species of *Helina* Robineau-Desvoidy, 1830 were found in the material examined. Three *Helina* specimens were representatives of two new species, which are described below.

Alluaudinella bivittata (Macquart, 1843)

Material examined: 1 ♂, Andranomena Sp. Res., 20°08'52,2"E44°30'52", 27 m, 02.02.2013, loc. coll.; 1 ♂, Montagne d'Ambre N. P., 12°312'37"E49°10'15", 1.040 m, 13.-18.01.2016, YPT, loc. coll.

Helina amboa spec. nov.

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Material examined: ♂ holotype and 1 ♀ paratype with identical locality labels: Madagascar, Ambohitantely Spec. Res., S18°11'54,9"E47°16'52,6", 1.580 m, 20.-25.11.2011, loc. coll.
The female paratype is lacking almost all large setae but the scars where the setae were inserted are well visible. In addition, the neck is partially damaged and the head is only loosely connected to the thorax.

Etymology: The name of the new species "*amboa*" is a modified feminine adjective referring as a short form to Ambohitantely Spec. Res., the place where the type specimens had been found.

Description (male): Head (Figs 17 & 18). Ground-colour dark grey, partly blackish, depending on incidence of light densely whitish dusted (Fig. 17). Eyes with very few scattered microscopic small hairs, facets adjacent to frons marginally enlarged. Shortest distance between eyes about twice as wide as diameter of anterior ocellus, fronto-orbital plate at middle of frons not as wide as anterior ocellus. Fronto-orbital plates separated by a frontal vitta, at middle of frons barely half as wide as anterior ocellus and strongly dilating towards anterior margin. Parafacial at basis of antenna about as wide as depth of postpedicel, somewhat narrowing downwards. Facial ridge broad, but not as wide as parafacial. In profile upper mouth margin slightly but clearly behind profrons (Fig. 18). Genal depth below lowest eye-margin almost 1.5 times as wide as depth of postpedicel. In anterior view fronto-orbital plate and parafacial silver-white dusted, ocellar tubercle and frontal vitta black, face and facial ridge dark, at certain angle of light dusted greyish, peristomal area and gena matt greyish to dark. Antenna predominantly dark brown to black, at certain viewing angles dusted grey. Postpedicel about 2.2 times as long as deep and about twice as long as pedicel. Arista brown, about twice as long as length of postpedicel, longest hairs of arista about as long as depth of postpedicel. Fronto-orbital plate in anterior half with five inclinate fronto-orbital setae, the anterior setae longer, the upper ones decreasing in length, upper part of frons bare. Parafacial and facial ridge bare, apart from the group of setulae at the basis of facial ridge. Vibrissal setae strong and about three times as long as the longest surrounding peristomal setae. Lateral surface of upper part of gena bare, lower half and margin with some seta-like hairs. Proboscis short slightly bulbous, prementum dark brown, depending on incidence of light somewhat shiny or dusted greyish, labella about 1.5 times as long as widest depth of proboscis; palpus darker than prementum, slender, slightly clavate and curved, somewhat longer than prementum.

Thorax (Figs 10 & 11). Ground-colour brown to dark brown and at certain viewing angle shiny brown or with areas dusted greyish, the latter, depending on the source of illumination, with more or less bluish tinge. In postero-dorsal view, mesonotum from the anterior margin to the prescutellar suture with a very broad whitish-grey median stripe covering the surface between the outer margins of the rows of dorsocentral setae in the anterior half and widening in front of the third pair of postsutural dorsocentrals to a broad grey prescutellar band, covering the width of mesonotum to the scutellar suture (Fig. 10); on the whitish-grey surface between the rows of dorsocentrals two narrow paramedian shiny brown stripes along the inner side of the row of dorsocentral setae, the stripes extending from the anterior margin of the mesonotum to the second pair of postsutural dorsocentrals at certain viewing angle. Lateral parts of mesonotum outside the greyish surface and in front of the greyish prescutellar band dark brown, depending on condition of light somewhat shiny or sparsely dusted greyish. Postpronotal lobes dusted whitish-grey. In lateral view the parts of presutural mesonotum, notopleuron and the supra-alar area either slightly shiny or thinly dusted depending on angle of viewing. Dorsal surface of scutellum (Fig. 10) predominantly dusted greyish with a weak yellowish tinge, the lateral surfaces depending on angle of viewing uniformly brown or greyish. Pleura brown and at certain incidence of light densely dusted grey (Fig. 11). Anterior and posterior spiracle brown. Mesonotum and scutellum evenly but not densely covered with short dark seta-like hairs, pleura less hairy. Acrostichals 0+1, the seta barely half as long as the posterior dorsocentral seta, the presutural acrostichal hairs in four median rows, in addition an irregular row of setulae along inside of the rows of dorsocentrals; dorsocentral setae 2+3, the anterior presutural dorsocentral somewhat shorter than the other dorsocentrals; posthumeral 1; presutural 1; postpronotal setae 2, the outer one clearly longer than the inner seta; anterior notopleural seta longer than the posterior, notopleuron without setulae; prealar seta not distinguishable from ground-hair; intra-alar seta 2, the anterior one longer than the posterior seta, supra-alar setae 2, the posterior seta barely distinguishable from ground-hair; postalar setae 3, the most posterior seta barely longer than the ground hair. Prosternum, proepimeral area, anepimeron, katepimeron and meron bare. Katepisternal setae 2+2, the lower posterior seta closer to the posterior than to the anterior upper seta, the anterior lower seta distinctly weaker and shorter; anepisternal setae 1+6 differently long and strong, only a few interstitial hairs, barely distinguishable from ground-hair. Scutellum with long apical and lateral setae, basal setae distinctly longer than ground-hair, pre-apical setae not distinguishable from ground-hair; lateral surface and ventral surface completely bare.

Wing (Fig. 10). Membrane predominantly hyaline, in certain light conditions with a very weak brownish tinge, cross-veins dark but not really infuscate (Fig. 10). Tegula and, basicosta dark brown, wing veins brown. Costal spine clearly longer than cross-vein r-m. Radial node and veins ventrally and dorsally bare. Vein M straight, diverging slightly from vein R4+5. Cross-vein r-m at the level of the point where vein R1 enters costa, distal cross-vein dm-cu weakly sinuous and oblique. Calypters predominantly whitish matt transparent, margin of upper calypter purely white, of lower calypter white with a yellowish tinge, lower calypter about 1.5 times as long as upper calypter. Haltere predominantly yellowish-white.

Legs (Fig. 11). Femora dark brown, tibiae and tarsi brown. Pulvilli and claws well developed, about as long

as the associated fifth tarsomere. Hind coxa bare on the posterior surface. Fore femur with complete rows of strong posteroventral, posterior and posterodorsal setae, all posterodorsal setae about as long as depth of femur, posteriors about half as long, the posteroventrals distinctly longer and stronger than posterodorsal setae. Fore tibia without a median posterior and a distinct anterodorsal seta. Mid femur in basal half with a row of strong bristle-like setae in the upper half of the anterior surface, the setae about half as long as depth of femur, three posteroventral setae not as long as depth of femur in basal third, and in distal third a row each of short anteroventral and posteroventral hairs, about one third as long as depth of femur, preapically usually three strong posterior to posterodorsal setae and a distinct anterodorsal seta. In middle third of mid tibia two strong posterior setae somewhat longer than the diameter of tibia. Hind femur with a complete row of strong anterodorsal setae slightly longer than depth of femur, distal half with a row of anteroventral setae, the most distal seta longer than depth of femur, in basal half one anteroventral seta about half as long as depth of femur and about two anteroventrals somewhat stronger and longer than the ground-hair, pre-apically two well developed posterior to posterodorsal setae. Hind tibia without long posterodorsal seta; about in middle third two anterodorsals, slightly longer than diameter of tibia, at the level of the more distal anterodorsal setae two anteroventral setae not as long and strong as the anterodorsals, the distance between the two anteroventrals shorter than their length.

Abdomen (Figs 10 & 11). Ground colour light grey, in postero-dorsal view anterior part of syntergite 1+2 brown, posterior part light grey and with a wide triangular-shaped brown patch narrowing into a median stripe that continues along the subsequent tergites: as a narrow median stripe on tergite 3, on tergite 4 diffusely broadened in the anterior part to a median brown patch without a clear shape being recognizable, and in tergite 5 dilated to a small triangle-shaped patch continued as narrow stripe to the posterior margin (Fig. 10). Ventral parts of tergites grey or brownish depending on incidence of light without a dark pattern. The basis of marginal and discal setae surrounded by a distinct dark brown spot, smaller hairs with or without clear dark dots at the basis. Posterior part of of syntergite 1+2 with a conspicuously strong lateral marginal seta, about as long as the long marginals of tergite 4 (Fig. 11). Tergite 3 with short but distinct marginal setae, tergite 4 with a complete row of long marginals and some shorter discal setae and tergite 5 with complete rows of discals and marginals. Sternites grey or brownish, depending on incidence of light; sternite 1 bare and glossy dark brown in striking contrast to the subsequent sternites.

Male genitalia. Hypopygium distinct. The species is clearly distinguished from similar species of the genus by morphological characters, the identification does not depend on comparison of characters of genitalia. Therefore, the genitalia have not been extracted to avoid damage to the only available male of this new species.

Measurements: Length of body about 5.3 mm; length of wing about 4.7 mm.

Description (female): Head (Fig. 19 & 20). Ground-colour dark, more or less densely dusted greyish. Dichoptic; eyes rather small, with scattered microscopic small hairs, facets of about equal size. Frons slightly dilating, at level of vertex almost half as wide as maximal head width; at level of anterior ocellus about 3.3 times and at anterior margin of frons 3.9 times as wide as the distance between the outer margins of posterior ocelli. Fronto-orbital plate at middle of frons almost three times as wide as anterior ocellus; tip of frontal triangle reaching about the level of second pair of fronto-orbital setae, in anterior view tip is connected via a line-shaped stripe with anterior margin of frons (Fig. 19), frontal vitta almost parallel-sided, but narrowing distinctly from level of anterior fronto-orbital seta to anterior margin, at midway about 2.5 times as wide as the fronto-orbital plate. Parafacial tapering downwards, at level of antenna basis slightly wider than depth of postpedicel, at the level where parafacial and facial ridge separate about as wide as depth of postpedicel. Facial ridge in lower half about half as wide as depth of postpedicel. In profile upper mouth margin slightly behind profrons (Fig. 20). Genal depth below lowest eye margin about 1.7 times as wide as depth of postpedicel. In anterior view frontal vitta matt dark very sparsely dusted greyish, fronto-orbital plates uniformly dusted grey, frontal triangle dark and ocellar tubercle weakly shiny. Upper half of parafacial densely dusted white with a brown or darker patch about at level of pedicel, shape and colour of patch vary with the changes of incidence of light. Dusting of lower half of parafacial more light greyish to grey. Face and facial ridge dark but almost consistently dusted greyish white. Peristomal area and anterior part of gena dark and in general uniformly dusted greyish. Pedicel and postpedicel predominantly dark brown and depending on viewing angle with some grey dusting. Postpedicel about 2.6 times as long as deep and about twice as long as pedicel. Arista brown, about twice as long as length of postpedicel, longest hairs of arista about as long as depth of postpedicel. Anterior half of fronto-orbital plate with three inclinate setae, the anterior one only slightly longer than the upper setae, upper half of frons with two strong reclinate orbital setae, the upper one as long as the upper fronto-orbital setae. Ocellar setae clearly longer than the longest fronto-orbital seta. Vertical setae about as long as ocellar setae. An irregular row of very small setulae between the fronto-orbital setae and the eye margin, in addition two or three bigger setulae at the lower part of fronto-orbital plate, upper part of frons at level of reclinate orbitals practically without setulae. Parafacial

and facial ridge bare. Vibrissal setae strong and about 1.5 times as long as the longest surrounding peristomal setae. Lateral surface of gena bare, lower margin with black setulae and a row of strong setae. Proboscis short, prementum dark matt brown, labella at least 1.5 times long as widest depth of proboscis; palpus black, slender and at least as long as prementum.

Thorax (Fig. 12). Similar to male, but in general more greyish (Fig. 12). In postero-dorsal view the grey prescutellar band narrower than in male; in addition to postpronotal lobe also notopleuron and adjacent area of mesonotum dusted whitish-grey. The lateral surfaces of scutellum independent from viewing angle consistently greyish. No row of presutural acrostichal setulae along inside of the rows of dorsocentrals, but few single setulae are present.

Wing. As in male, but cross-vein r-m slightly darker than in male.

Legs. Similar to the male. Pulvilli and claws well developed, but smaller than in male. Mid femur without posteroventral setae in basal half but with one strong ventral seta about half as long as depth of femur. Hind femur in distal half with three strong anteroventral setae and in basal half one strong anteroventral seta somewhat shorter.

Abdomen (Fig. 12). Ground-colour uniformly dusted cinereous, in certain light conditions with a yellowish tinge, without distinct dark pattern, only in direct postero-dorsal view tergites 4 and 5 with a very narrow and very faint brown to dark longitudinal stripe. Tergite 3 laterally with some strong marginals, tergite 4 with a complete row of long marginals and laterally some strong discal setae, tergite 5 with a complete row of discals and without marginals. Sternites grey; sternite 1 bare and glossy dark brown in striking contrast to the other sternites.

Female genitalia. Not investigated.

Measurements: Length of body about 5.5 mm; length of wing about 5.0 mm.

Diagnosis: In the recently published identification table for the Madagascan *Helina* species (Zielke 2021e), *Helina amboa* spec. nov. ends at *Helina cyanea* (Stein, 1906). However, when comparing the type-specimens of *Helina amboa* with the syntypes of *H. cyanea*, the differences between the species become very clear. The thorax and abdomen of *H. cyanea* are uniformly shiny metallic dark blue with faint brownish or brownish grey dusting and there is no pattern on the mesonotum or abdomen. In addition, at certain incidence of light the syntergite is slightly brassy reflecting. On the other hand, in *Helina amboa*, the ground colour of thorax is dark brown and, depending on light conditions shiny or dusted, in the latter case either predominantly grey, or greyish with a more or less distinct bluish tinge. However, when illuminated with a certain type of light, such as bright daylight, the bluish tinge of body colour can be strongly pronounced. The mesonotum is marked by distinct longitudinal brown stripes regardless of the viewing angle. The abdomen is dusted uniformly greyish-white and the male is characterized by a brown median longitudinal stripe which is partially widened in the two posterior tergites. The colour of the abdomen is even paler in the female and there is practically no median stripe. Only on tergites 3 and 4 is a short, very thin and faint brownish longitudinal line seen from certain point of viewing.

When using Van Emden's identification key to the African *Helina* species, the taxonomic characters of *Helina amboa* lead directly to *Helina juxtamedialis* Van Emden, 1951. However, instead of having two pairs of dark brown spots on the densely cinereous dusted abdomen as reported for *H. juxtamedialis*, the male of the new species has the brown median stripe as described above and the female is practically without a distinct dark abdominal pattern.

The characteristics of *Helina amboa* also do not agree with the combinations of taxonomic criteria listed by Pont (1978) for the three *Helina* species described from the Comoros Archipelago.

Helina hesitancia spec. nov.

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Material examined: ♀ holotype, Madagascar, Ambohitantely Spec. Res., S18°11'54,9"E47°16'52,6", 1.580 m, 20.-25.11.2011, loc. coll. The left mid leg is missing.

Etymology: The epithet "hesitancia" is a feminine adjective and somewhat modified it refers to the initial hesitancy in assigning the female to a new species.

Description (female): Head (Figs 21 & 22). Ground-colour dark, in certain light condition almost black, sparsely dusted greyish. Dichoptic; eyes relatively small, with very few single short hairs, facets of about equal size. Frons (Fig. 21) strikingly wide, in anterior view somewhat dilating to anterior margin, at level of vertex almost half as wide as maximal head width; at level of anterior ocellus 4.0 times and at anterior margin 4.7 times as wide as the distance between the outer margins of posterior ocelli. Fronto-orbital plate at middle of frons about twice as wide as anterior ocellus; frontal triangle weakly demarcated, not much larger than ocellar tubercle, the anterior tip reaching about the level of lower orbital seta; frontal vitta at midway about four times as wide as the fronto-orbital plate. Parafacial strikingly tapering downwards, at level of antenna basis almost twice as wide as depth of postpedicel, at the level of mouth margin about twice as wide as anterior ocellus. Facial ridge about parallel-sided, almost half as wide as depth of postpedicel. In profile (Fig. 22) upper mouth margin clearly behind the strongly pronounced profrons. Genal depth below lowest eye margin about 1.7 times as wide as depth of postpedicel. In anterior view frontal vitta matt dark very sparsely

dusted greyish, fronto-orbital plates depending on incidence of light blackish and also very sparsely dusted greyish or partially weakly shiny, or more densely dusted grey, frontal triangle dusted greyish-white and ocellar tubercle depending on viewing angle black or greyish-white, concolourous with frontal triangle. Depending on angle of viewing, parafacial black or densely dusted greyish-white, in the upper half with a dark patch (Fig. 22) that changes shape depending on light conditions. Face and facial ridge dark with almost consistent greyish white dusting. Peristomal area and anterior part of gena dark brown with a distinct reddish-brown tinge, only at certain incidence of light sparsely dusted greyish. Pedicel of antenna dark, somewhat shiny or greyish dusted depending on viewing angle, postpedicel dark brown and dusted grey. Postpedicel about two and a half times as long as deep and almost three times as long as pedicel. Arista brown, about twice as long as length of postpedicel, longest hairs of arista about half as long as depth of postpedicel. Anterior half of fronto-orbital plate with three inclinate setae, the anterior one longer than the upper setae, upper half of frons with two strong reclinate orbital setae, the upper one somewhat longer and almost as long as the upper fronto-orbital setae. Ocellar setae at least twice as long as the longest fronto-orbital seta. Several small proclinate setulae between eye margin and fronto-orbital setae, upper part of frons without setulae. Parafacial bare, lower half of facial ridge with some small setulae. Vibrissal setae strong, barely twice as long as the longest surrounding peristomal setae. Lateral surface of gena bare, lower margin with black setulae and a row of strong setae. Proboscis short somewhat bulbous, prementum dark brown, greyish dusted or shiny at certain angle of light, labella about 1.5 times as long as largest depth of bulbous proboscis; palpus black and clavate, about as long as prementum.

Thorax (Figs 13 & 14). Ground colour dark brown, partially densely dusted grey with a clear bluish tinge which is more or less strongly pronounced depending on the lighting conditions. In postero-dorsal view (Fig. 13), mesonotum with a very broad median bluish-grey longitudinal stripe from the anterior pair of presutural dorsocentral seta to the prescutellar suture, in the presutural part of the mesonotum the stripe covers the width between the rows of the dorsocentral setae including the outer margins of the setae, and in the postsutural part correspondingly the width between the intra- alar setae; the remaining surface of the mesonotum, particularly anterior to the stripe and the lateral parts of the mesonotum dark brown, except for the area in front of the posthumeral setae and outside the anterior presutural dorsocentral setae, which is including the adjacent pronotal lobe dusted more greyish-white (Fig. 13). The bluish-grey stripe between the rows of dorsocentrals on each side with a paramedian brown longitudinal stripe between presutural dorsocentral setae and acrostichal setulae, extending beyond the transverse suture, reaching about the second pair of postsutural dorsocentrals. A relatively short, elongated, narrow dark spot outside and parallel to the row of postsutural setae. Dorsal and lateral surfaces of scutellum usually concolourous to mesonotum, however, when viewed from certain angles dark brown. In lateral view (Fig. 14) and depending on conditions of light the lateral surface of mesonotum, reaching almost basis of wing dusted bluish-grey. Pleura predominantly dark, partially dusted greyish depending on incidence of light. Anterior and posterior spiracle dark. Acrostichal setae not distinguishable from ground-hair, the presutural acrostichal setulae in two median rows, the distance between the rows shorter than the length of the setulae; dorsocentral setae 2+3, all very long, the anterior presutural dorsocentral seta somewhat shorter than the other dorsocentrals; posthumeral 1; presutural 1; postpronotal setae 2, the outer one clearly longer than the inner seta; notopleural setae 2, about equally strong, notopleuron without setulae; prealar seta not distinguishable from surrounding setulae; intra-alar setae 2, both well-developed, supra-alar setae 2, the posterior seta somewhat longer than ground-hair; post-alar setae 3, the most posterior seta very small, barely longer than ground hair. Prosternum, proepimeral area, anepimeron, katepimeron and meron bare. Katepisternal setae 2+2, the lower posterior seta about equidistant from posterior and anterior upper setae, the anterior lower seta strikingly weak and much shorter than the other katepisternals; anepisternal setae 1+6 differently long and strong, only very few interstitial hairs, barely distinguishable from ground-hair. Scutellum with long apical and lateral setae, basal seta very short but distinctly longer than ground-hair, pre-apical seta barely distinguishable from ground-hair; lateral and ventral surfaces completely bare.

Wing (Fig. 14). Membrane hyaline with a very weak yellowish tinge, cross-veins not infuscate. Tegula and basicosta dark brown, wing veins yellowish-brown. Costal spine at least as long as cross-vein r-m. Radial node and veins ventrally and dorsally bare. Vein M straight, almost parallel to vein R4+5. Cross-vein r-m slightly apicad of the point where vein R1 enters costa, distal cross-vein dm-cu weakly sinuous and barely oblique. Calypters whitish matt transparent, margin of upper calypter almost purely white, of lower calypter yellowish-white, lower calypter about 1.5 times as long as upper calypter. Stem of haltere yellow, knob predominantly yellowish-white (Fig. 14).

Legs (Fig. 14 & 23). Uniformly dark brown. Pulvilli and claws well developed, not as long as the corresponding tarsomeres. Hind coxa bare on the posterior surface. Fore femur with complete rows of strong posteroventral, posterior and posterodorsal setae, all posterodorsal setae about as long as depth of femur, posteriors about half as long, the posteroventrals somewhat longer and stronger than posterodorsal setae. Fore tibia without a median posterior and a distinct anterodorsal seta. Mid femur in basal half with a row of strong bristle-like setae in the upper half of the anterior surface, the setae about half as long as depth of femur, one posteroventral

seta not as long as depth of femur in basal third, and in distal third a row of few short posteroventral seta-like hairs, about one third as long as depth of femur, preapically two strong posterior to posterodorsal setae and a distinct anterodorsal seta. About in middle third of mid tibia two strong posterior setae and two anterodorsal setae, each one about opposite of the posterior seta (Fig. 23), the four setae about equally long and somewhat longer than the diameter of tibia. Hind femur with a complete row of strong anterodorsal setae about as long as depth of femur, distal half with three or four anteroventral setae about as long as anterodorsal, and in basal half one anteroventral seta about half as long as depth of femur, pre-apically two well developed posterior to posterodorsal setae. Hind tibia, about in middle third two anterodorsal and two anteroventral setae, all at least as long as diameter of tibia.
Abdomen (Fig. 14 & 15). Ground colour grey with a bluish tinge depending on lighting conditions more or less pronounced. Syntergite 1+2 usually uniformly dusted greyish, at certain viewing angles weak brownish, tergites 3 and 4 greyish dusted, depending on viewing angle the dorsal surface either largely weak brownish coloured or with two large faint brownish patches (Fig. 15) of varying shape when incidence of light changes, tergite 5 without any brownish pattern. Lateral and ventral parts of tergites dusted bluish-grey (Fig. 14), ventral margins of tergites adjacent to sternites brown. Mainly based on the size of the scars of missing major setae it can be concluded that there is a row of short but distinct marginal setae on tergite 3, tergite 4 with a row of stronger marginal and a few lateral discal setae, tergite 5 with a row of distinct discals, marginals not recognizable. Depending on the incidence of light, sternites dark grey or brownish, sternite 1 dark brown, without any setulae.
Female genitalia. Not investigated.

Measurements: Length of body about 5.4 mm; length of wing about 5.0 mm.

Male: Not known.

Diagnosis: Using the key to the Malagasy *Helina species* (Zielke 2021e), the new species is closest to *Helina cyanea*, but its general appearance is even more similar to the above described *Helina amboa*. However, *Helina hesitancia* spec. nov. differs clearly from both species in the two anterodorsal setae of the middle tibia and in the katepisternal setae of which the posterior lower seta is equidistant from the anterior and posterior upper seta. Whereas the mid tibiae of the other two species are without anterodorsal setae and the lower katepisternal seta is significantly closer to the posterior upper seta. *Helina hesitancia* ends in Van Emden's identification key at couplet 62 (49), there it says: "...Wings always with dark suffusions on r-m and m-m, although these are faint in *testacea* and *flavitibia*." The cross-veins of the wings are not even faintly infuscate in the new species, and other characters used by Van Emden in subsequent couplets to identify *Helina testacea* (Malloch, 1921) and *Helina flavitibia* Van Emden, 1951 are also inconsistent with the taxonomic characters of this new species. And with regard to the hitherto known *Helina* species from the Comoros Archipelago (Pont 1978), no species is characterized by two anterodorsal bristles on the middle tibia.

Helina ranoma Zielke, 2021

Material examined: 1 ♀, Rés. Expérim. de Vohima, „Circuit 2 PK 19" S18°55'09.1"E28°29'48,7", 949 m, 21.08.2012, loc. coll.

Discussion

By far the most numerous species in this collection is *Deltotus facetus*. A total of 93 specimens were counted. Eggs of *Stylogaster* Macquart, 1835 attached to different parts of the body were found in a strikingly large number of specimens of this species. Similar observations on the infestation of Madagascan Muscidae with *Stylogaster* eggs were also reported by Couri & Pont (2006) and Couri & Barros (2021). The second most common species is *Myospila lenticeps* with 33 specimens, followed by *Graphomya rossi* and *Hydrotaea bella* with 27 and 21 specimens, respectively. All other taxa are represented with less than 10 individuals per species.
Some *Graphomya* species seem to have a fairly large intraspecific variability. Hennig (1964) reports that Zimin (1951) defined five different forms of *Graphomya maculata* (Scopoli, 1763) from the area of the former USSR alone, a species widespread in different zoogeographical regions. Individual variability was also observed in the 27 females of *Graphomya rossi* examined, the only *Graphomya* species known from Madagascar. In two of the females, the typical criterion for *Graphomya*, namely the absence of the anterior katepisternal seta, did not apply. Both specimens exhibited this anterior seta, albeit somewhat smaller than the posterior seta. Van Emden (1939) reported similar observations for *Graphomya eustalia* (Walker, 1849). The basic structure of the thoracic pattern of *G. rossi* females was uniform, but the longitudinal stripes varied greatly in width, length, and colour intensity. Although the females practically all came from the same locality, the differences between the individual flies varied in severity and sometimes also showed transitions between the various characteristics. This is also true for the scutellum that was either predominantly grey including the lateral surfaces or had a more or less wide ochre-yellow margin and yellow-brown lateral surfaces. On the other hand, all females had no setulae over the posterior coxa, although according to Vockeroth (1972) these are typical for *Graphomya*. However, due to the

various intermediate forms no criteria could be found that would have justified a taxonomic subdivision of the group. It is also not possible to assess whether there is a similar variability in the taxonomic characteristics of the males, as only one male specimen of the species is known to date. When characterizing the female, it has already been pointed out that the sexes of *G. rossi* differ significantly in some features, for example in the colouring of the legs and abdomen.

Of the five *Gymnodia* species reported from Madagascar, *Gymnodia differa* was the first species of this genus described from Madagascar. *Gymnodia malagasya* spec. nov. is now the sixth species of the genus known from the Malagasy subregion and the second to be described from the country. Similar to *G. differa*, the new species from Madagascar does also not show an *Anthomyia* pattern of the mesonotum, which otherwise is typical for several *Gymnodia* species. The other four species known from Madagascar have already been reported from other parts of Africa (Pont 1980). Whether the two species described from Madagascar are also endemic to the island region, like the genus *Deltotus* and its three taxa and various species of the genus *Dichaetomyia*, or whether they will also be found in other African countries remains to be seen. However, since research into the Afrotropical muscid fauna is progressing very slowly, it will probably take years before a reliable assessment of the distribution is possible. This also applies to the species of the genus *Helina* described from Madagascar recently. Together with the two newly introduced species *Helina amboa* spec. nov. and *Helina hesitancia* spec. nov. eleven species of this genus are now known from this region. Only one of them, namely *Helina lucida* (Stein, 1913), and not three, as recently incorrectly claimed (Zielke 2021e: p. 208), has not been described from Madagascar. But here, too, it will only become clear over the years whether the species described from Madagascar are actually endemic to this area or whether they also occur on the African mainland or other island regions of the continent.

Acknowledgements

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